CHAPTER 1 - PURPOSE AND NEED

1.1 INTRODUCTION

Interstate 80 (I-80) is a major transcontinental roadway connecting New Jersey (near Ridgefield Park) with San Francisco, California and it is a vital part of the Interstate System, which became a reality during the presidency of Dwight D. Eisenhower with the passage of the Federal-Aid Highway Act of 1956 on June 26, 1956. The segment that runs through Utah has a predominately east-west alignment and acts as an important element of Utah's transportation system, linking both Summit and Tooele counties to the Salt Lake metropolitan area, as well as providing an important connection to the north-south corridor of I-15 and to the I-215 beltway.

During its lifetime, I-80 has experienced an increase in usage due to its connections with other major transportation corridors, such as I-15, SR-201, and I-215. As traffic volumes on those corridors have increased, so have the traffic volumes on I-80, especially through the project area. This heavy usage, coupled with the limited life-span of the roadway infrastructure, has resulted in deterioration of both the roadway surface and the structural integrity of the bridges and access ramps, as well as higher levels of traffic congestion and accident rates within the project area.

1.2 PROJECT AREA

Project Location

The proposed project area is located in Salt Lake County, Utah and includes portions of Salt Lake City and the City of South Salt Lake. The proposed project area includes an approximately 1.8 mile section of I-80 beginning east of its connection with I-15 at State Street (including the State Street on/off ramps) and ending at 1300 East (including the 1300 East on/off ramps). See Figure 1-1. This area receives a high volume of traffic and includes a concentration of deficient bridge structures that have experienced considerable wear and tear over their lifespan.

The northern and southern boundaries of the study area are limited to those areas immediately adjacent to the I-80 corridor (with the exception of certain resources that may require a wider study area for proper analysis) based on the assumption that the proposed improvements would not extend beyond the existing right-of-way. There are

several north-south state routes and local streets that cross I-80 within the project area. See Figure 1-2. The cross streets (except 1300 East) cross under I-80.

Figure 1-1. Project Location Map

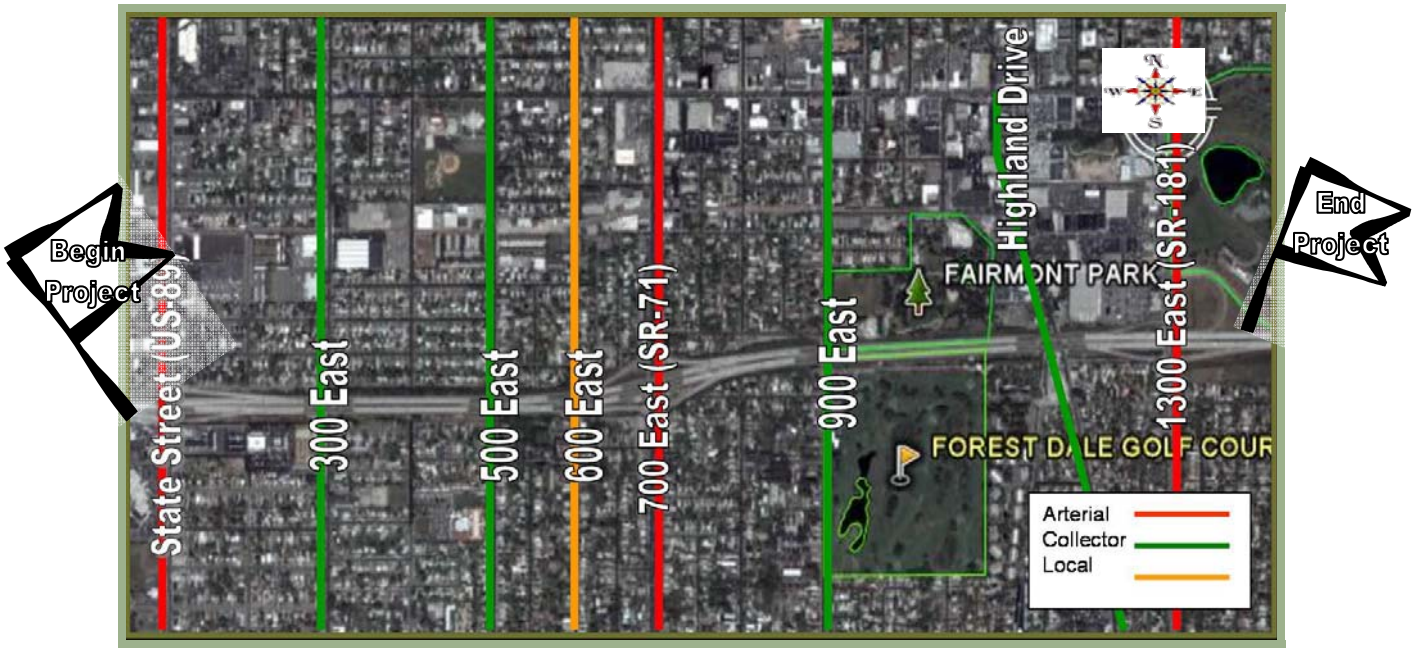


Figure 1-2. Cross-Streets Within the Project Area

Currently, I-80 is a six-lane roadway (i.e., three travel lanes in each direction) with an open median between directional travel lanes throughout the project area. Through the majority of the project area, I-80 is an elevated freeway with interchanges at State Street, 700 East, and 1300 East. The State Street and 700 East interchanges consist of a diamond configuration and 1300 East merges a diamond configuration with a loop on-ramp going westbound. The existing typical section, shown in Figure 1-3, includes:

- Three 12-ft travel lanes in each direction with 10-ft outside shoulders and 6-ft inside shoulders
- Open 40-ft median between directional travel lanes from State Street to 1300 East
- Intermittent concrete barriers along outside shoulders; railings along the bridges
- Variable 200 to 360-ft right-of-way throughout project area

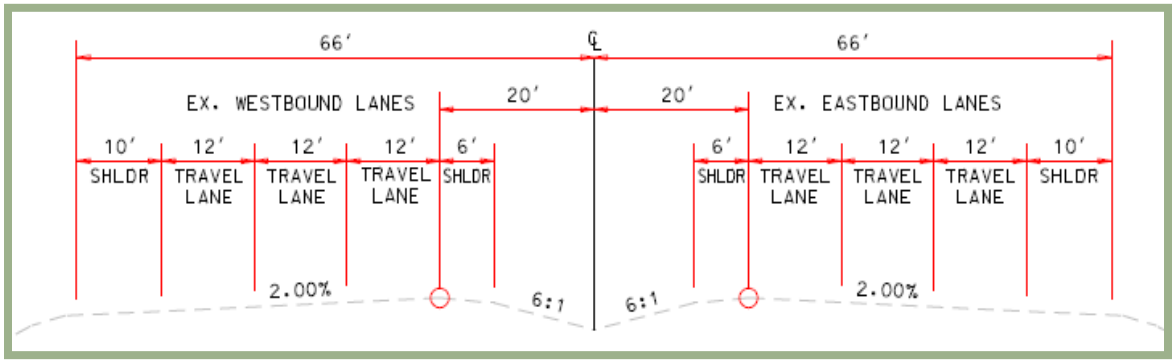


Figure 1-3. Existing Typical Section of I-80

1.3 PURPOSE OF THE PROJECT

Due to the safety concerns stemming from the deterioration and deficiencies of the roadway and its bridge structures in the project area, as well as the continuing traffic flow problems and congestion, the Utah Department of Transportation (UDOT) proposes to make improvements to I-80. The purpose of the proposed project is to improve the operational function of I-80 as a national, regional, and local transportation facility through bridge replacement, improving safety and traffic flow, and accommodating current and future travel demand. It is anticipated that the majority of the roadway improvements would remain within the existing right-of-way of the roadway corridor with no substantial changes or reconfigurations of the interchanges.

This project is included in Utah's FY 2006-2010 Statewide Transportation Improvement Program (STIP) and also in the Wasatch Front Urban Area Long Range Transportation Plan (LRTP) for 2002-2030 and 2004-2030 LRTP Update, which was prepared by the Wasatch Front Regional Council (WFRC) as the Metropolitan Planning Organization

(MPO)[1] for Salt Lake, Davis, and Weber Counties. Funding for this project is slated to come from state funds with an anticipated phasing of the construction.

1.4 NEED FOR THE PROJECT

The need for the project lies in the history of I-80 itself. I-80 is part of the original interstate highway system in the United States. This portion of I-80 was constructed in the mid- to late 1960s, and has not had any major improvements or modifications since its initial construction.[2]

UDOT Strategic Goals
- ✓ Taking Care of What We Have
- ✓ Making the System Work Better
- ✓ Increasing Capacity
- ✓ Improving Safety

The 1998 I-80 Major Investment Study (MIS) identified the section of I-80 from State Street to 1300 East as needing immediate repair and/or reconstruction. Reconstruction of I-80 extending to the mouth of Parley's Canyon has been identified in the WFRC 2002-2030 LRTP as being necessary by 2020.

The needs identified in this ES for the I-80 corridor (discussed in detail below) are:

- Infrastructure Deterioration *["Taking Care of What We Have"]*
- Operational Deficiencies *["Making the System Work Better"]*
- Traffic Flow and Congestion *["Increasing Capacity"]*
- Safety Issues *["Improving Safety"]*

1.4.1 Infrastructure Deterioration ["Taking Care of What We Have"]

Pavement Deterioration


Cracking on State Street Overpass

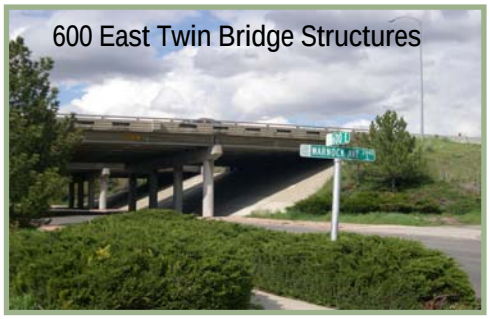
Pavement condition is judged upon its structural integrity, surface visual quality, rideability and skid resistance.[3] The mainline portion of I-80 in the project area was originally built in 1965 using Portland Cement Concrete Pavement (PCCP). Despite the attempts at upkeep, the pavement surface shows signs of deterioration and wear, including cracking, potholes, etc. The rideability of the pavement is poor due to asphalt bridge transitions in the area that suffer from fatigue. According to a 2004 memorandum from the UDOT Region Two Pavement Management Engineer, the concrete is in poor condition and is rapidly deteriorating, having reached the end of its functional design life. See Chapter 4 – Comments and Coordination.

[1] Metropolitan Planning Organizations (MPOs) are the agencies responsible for transportation planning in urbanized areas throughout the United States.

[2] Routine maintenance, pavement and structure rehabilitation, and emergency bridge repairs/rehabilitation have been made as necessary to extend the life of the roadway. The most recent rehabilitation effort was in 2000 to extend the life of the structures until 2012, with maintenance work occurring near 700 East as recently as August, 2006.

[3] Skid resistance is defined as a roadway's ability to provide traction for vehicles while braking and cornering, especially when wet.

Bridges



There are eight twin bridge structures along the I-80 corridor within the project area (located at State Street, 300 East, 500 East, 600 East, 700 East, 900 East, Highland Drive, and 1300 East). According to a review of the existing bridge structures in the project area conducted in connection with this Environmental Study (ES), five of the eight twin bridge structures have been classified as Structurally Deficient. A Structurally Deficient rating means that the bridge components are either in poor condition or are no longer adequate to handle the design loads. The Structurally Deficient bridge structures are located at State Street, 300 East, 500 East, 600 East, and Highland Drive.

Three of the eight twin bridge structures in the project area are classified as Functionally Obsolete. This means that they are lacking current American Association of State Highway and Transportation Officials (AASHTO) geometric design requirements, such as bridge widths, lateral and vertical clearances, and/or adequacy to handle design loads and traffic volumes. The Functionally Obsolete bridge structures are located at 700 East, 900 East, and 1300 East. All of the bridges lack sufficient deck width to comply with current AASHTO requirements for cross section elements for the proposed expansion, such as lane width, shoulders, etc.

Since all of the bridges were originally built within a relatively short time of each other[4], they exhibit similar evidence of deterioration and damages, such as cracking, delamination,[5] efflorescence,[6] spalling,[7] and the exposure of steel rebars in both the bridge decks and the substructures. Water leakage through the expansion joints has impaired the integrity of the exterior girder bearing seats and there is rust on several of

[4] From 1964-1967.
[5] Delamination is defined as the "separation of a laminate along the plane of its layers or the separation of bonded insulation within the adhesive layer or at the adhesive interface."
[6] Efflorescence is a white crystalline or powdery (often fluffy/fuzzy) deposit on the surface of masonry materials like concrete, brick, clay tile, etc., caused by water seeping through the surface. The water dissolves the salts inside the object while moving through it and then evaporates, leaving the salt on the surface.
[7] Spalling refers to minor cracks and bulges in concrete or masonry that can cause the concrete to dislodge or break away from the structure, frequently caused by corrosion of steel bars imbedded therein.

the girders[8]. The majority of the bridges show cracking in the abutment backwalls and/or the pedestals that support the girders and, in some areas, the slope protection underneath the bridges is displaced. See Table 1-1 – Summary of Existing I-80 Bridge Structure Deficiencies below for specifics as to deficiencies identified for each structure. Some examples of the deterioration identified in the project area are illustrated in Figure 1-4.

Figure 1-4. Examples of the Types of Deterioration of the I-80 Bridge Structures

Further, all of the bridges in the project area were built before the implementation of current seismic design criteria and, therefore, would be susceptible to sustaining significant damage and/or collapse during a major seismic event in or near the area.

Drainage

Several drainage deficiencies in the project area have been identified in connection with this ES, including:

- Many inlet drains are buried and/or silted.
- Many inlet drains lack riprap aprons.
- Access to the roadside ditches for maintenance is hampered by concrete barriers.
- Bridge drains have deteriorated.
- Several locations lack positive drainage outflow.

[8] Girders are beams of steel, wood, or reinforced concrete used as a main horizontal support in a building or bridge. Girder bearing seats support the girders and connect them to the backwalls of the bridge structure.

Table 1-1. Summary of Existing I-80 Bridge Structure Deficiencies

State Street	300 East	500 East	600 East	700 East	900 East	Highland Drive	1300 East
CLASSIFICATION OF BRIDGE STRUCTURE							
Structurally Deficient	Structurally Deficient	Structurally Deficient	Structurally Deficient	Functionally Obsolete	Functionally Obsolete	Structurally Deficient	Functionally Obsolete
DESCRIPTION OF BRIDGE CONDITIONS/DEFICIENCIES							
Superstructure/ Deck							
Deck is saturated with salt, has extensive cracking and also shows signs of efflorescence	Deck shows signs of spalling/ delamination	Deck is saturated with salt, has extensive cracking and also shows signs of efflorescence	Deck is in poor condition; 100% contaminated with salts and has heavy efflorescence	Deck has minor cracking and efflorescence; Lacks sufficient lateral under-clearance	Deck joints remain open and have several potholes in roadway; Lacks sufficient lateral under-clearance	Deck is affected by cracking and efflorescence staining; there are several potholes around the joints	Deck has salt saturation and efflorescence
Substructure/Piers and Columns							
Columns are cracking/spalling	Piers show signs of deterioration; Relief joints have opened up	Columns are cracking/ spalling	Cracking, spalling and exposed rebar on the columns and piers	Columns are cracking/spalling	Columns are cracking/spalling	Substructure is in poor condition, affected by cracking, spalling, and has section loss in the exposed rebar	Pier caps are spalling and have exposed rebar
Substructure/Parapets							
Parapets have spalling and exposed rebar	Parapets have spalling and exposed rebar	Parapets have spalling and exposed rebar	Parapets are deteriorating and contain areas of cracking/spalling	Parapets are deteriorating and contain areas of spalling	Overhangs and parapets have spalling and exposed rebar	Parapets have spalling and exposed rebar	Parapets have spalling and exposed rebar
Substructure/Diaphragms							
There are cracked diaphragms and efflorescence	There are cracked diaphragms and efflorescence	Many diaphragms are cracked	Many beam-end diaphragms are cracked and spalling with exposed rebar	There is extensive rust on the girders	Diaphragms under the joints have heavy spalling	At least 8 beam ends have cracked	Approach slabs have settled about 6 inches
Substructure/Backwalls							
Abutments are cracked and the backwall is leaking	Abutment backwalls are cracking and joints are open	Backwall cracking and pedestals are spalling	Overlay cracking along the deck joints	Backwall joints are open, with efflorescence seeping around beams	There is cracking in the backwalls	Backwalls have cracked	Backwalls have cracked
Miscellaneous							
Some drains are plugged	Slope protection joints are open	Sections of slope protection have displaced	Drains are buried	Sections of slope protection broken up	--------	Deck drains are covered with asphalt	Curbs and sidewalks are deteriorated

1.4.2 Operational Deficiencies ["Making the System Work Better"]

An evaluation of the existing conditions along the I-80 mainline, including the interchanges, was conducted in connection with this ES. The evaluation identified several different types of operational deficiencies along the I-80 corridor within the project area, especially in connection with the interchanges.

Mainline Operations

The I-80 mainline in the project area exhibits several deficiencies that relate to poor traffic flow conditions and safety concerns, including:

- *Shoulder Widths:* Narrow 8-ft shoulders on portions of I-80 results in having less space available for pullouts or emergency stops, leaving disabled vehicles partially in the travel lanes.
- *Medians:* The open 40-ft medians between the directional travel lanes along the I-80 mainline are too narrow to provide adequate protection against head-on collisions.
- *Auxiliary/Merge Lanes*: The lack of auxiliary or merge lanes on I-80 exacerbates the deficiencies in acceleration/deceleration lane lengths on the ramps, thereby causing congestion and higher accident rates due to vehicles weaving through traffic to either enter or exit the roadway.

Interchanges and Ramp Operations

All of the interchanges in the project area suffer from at least one or more types of operational deficiencies, including:

- *Lane Widths:* Lane widths along many of the I-80 ramps are too narrow, creating smaller spaces between vehicles, thereby decreasing driver comfort and safety.
- *Clear Zone Infringement:* A clear zone is defined as the total roadside border area, starting at the edge of the traveled way that is available for safe use by errant vehicles. Clear zone infringements on the ramps do not allow adequate recovery space for vehicles that may inadvertently leave the travel lanes.
- *Acceleration/Deceleration Lanes*: Many, if not all, of the ramps are lacking in sufficient length. Vehicles entering the roadway do not have sufficient time to reach freeway speeds before attempting to merge and those vehicles exiting the roadway back up into the mainline due to traffic capacity limits on the exit ramps that are insufficient to handle the demand.
- *Superelevation Deficiencies:* Superelevation (also known as banking[9]) provides resistance to the centrifugal forces acting upon moving vehicles during turning movements. Many of the ramps along I-80 have insufficient superelevation to prevent vehicles from leaving the traveled way while navigating curves.

[9]Examples of banking can be seen in many motor racetracks, such as the Daytona International Speedway in Daytona Beach, Florida.

1.4.3 Traffic Flow and Congestion ["Increasing Capacity"]

Improving Traffic Flow

The operational deficiencies of I-80 and its access points, including the lack of auxiliary/merge lanes and insufficient acceleration/deceleration lanes, contribute to the traffic flow and congestion problems and delays experienced in the project area. These deficiencies result in disruption of traffic flow from frequent lane changes/merges and slower speeds, thus impacting traffic mobility in the area. These problems will increase with the additional traffic that is expected in 2030.

Level of Service

Level of service (LOS) is a concept used to describe the operation of a roadway. Levels of service characterize traffic operations in terms of speed, average travel delay, travel times, freedom to maneuver, and driver comfort and convenience and range from a rating of "A" to "F", with A representing the most optimal operating conditions and F representing the worst operating conditions. In urban areas, such as the project area, a LOS D is acceptable for planning. Figure 1-6 is an approximate visual representation of LOS categories showing I-80 traffic conditions.

Figure 1-5. Level of Service

The *Highway Capacity Manual* defines the capacity of a roadway facility as the maximum "rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control conditions." Table 1-2 shows the LOS capacity for a freeway in an urban area in vehicles per day (vpd). Table 1-3 shows current and anticipated traffic volumes for I-80 through the year 2030 in vehicles per day (vpd), including LOS for a six-lane freeway in an urban area.

Table 1-2. Level of Service in Vehicles Per Day

Total Number of Lanes	LOS C (vpd)	LOS D (vpd)	LOS E (vpd)
6 Lanes	100,000	116,000	142,000
8 Lanes	133,000	154,000	189,000

Table 1-3. Current and Anticipated Traffic Volumes for the I-80 Mainline and Level of Service

I-80 Segments	2005	LOS	2015	LOS	2030	LOS
I-15 to State Street	109,000	D	132,100	E	164,700	F
State Street to 700 East	102,000	D	125,500	E	157,500	F
700 East to 1300 East	87,800	C	109,500	D	138,900	E
1300 East to I-215 split	69,500	C	87,700	C	115,400	D

*Source: *I-80: State Street to 1300 East Traffic Operations Analysis* in Appendix A
The highlighted area represents the project area from State Street to 1300 East.

By comparing the I-80 traffic capacity numbers to the anticipated traffic volumes for the I-80 mainline in Table 1-2, it becomes clear that additional capacity beyond the current six-lane configuration will be required to handle the expected traffic volumes in the project area. By the year 2015, the area between State Street and 700 East will exceed LOS D and by the year 2030, the entire project area will exceed LOS D and the area between State Street and 700 East is anticipated to fail.

1.4.4 Safety ["Improving Safety"]

Accident Rate

According to the Operational Safety Report issued by UDOT (see Chapter 4 – Comments and Coordination), there is a higher than expected accident rate for this type of roadway, although the severity rate is the same as expected. See Table 1-4.

Table 1-4. Comparison of Crash Rates, Severity, and Types of Accidents on I-80

STATE STREET TO 1300 EAST		YEARS COVERED			TOTAL NO. / AVERAGE	EXPECTED RATE[10]
		2002	2003	2004		
Number of Accidents Occurring		165	128	138	431/143.67	--
Accident (Crash) Rate[11]		2.06	1.69	1.33	1.89	1.50
Severity[12]		1.52	1.38	1.33	1.41	1.41
ACCIDENTS BY TYPE OF ACCIDENT FOR 2002-2004						
		TOTAL NO.			PERCENTAGE	
TYPES	Rear End Accident	293			68%	
	Single Vehicle Accident	80			18.6%	
	Side Swipe- Same Direction	42			9.7%	

[10] Expected Rate is the accident/severity rate anticipated for similar roadway facilities.
[11] Accident or Crash Rate is defined as number of accidents per million vehicle miles.
[12] Severity rate is an index calculated by type of injury suffered in an accident as a factor times the total number of accidents.

The main type of accident on I-80 is the rear-end accident, which is indicative of higher levels of congestion. The rear end crashes occurred mostly on the mainline and primarily under dry weather conditions. The single-vehicle crashes included hitting a fixed or non-fixed object (47.5%), running off the road (37.4%), other non-collision incidents (11.3%), and overturning in the roadway (3.8%). The single-vehicle accidents were not concentrated in any one area. Accident location data gathered from 2002 to 2004 (inclusive) indicates that there are a greater number of total accidents occurring in or near where the interchange on/off ramps connect with the mainline than occur along the mainline itself. See Figure 1-6.

Figure 1-6. I-80 Traffic Accident Distribution (2002-2004)

1.5 OBJECTIVES OF THE PROPOSED PROJECT

The WFRC has identified certain goals and objectives as part of its Long Range Transportation Plan[13] (LRTP). These goals include:

- Increasing transportation mobility and accessibility for both persons and freight, thus promoting economic vitality in the region;
- Increasing transportation safety and security for all modes of travel;
- Providing a transportation system that both protects and enhances the environment, promotes energy conservation, and improves the quality of life; and
- Protecting existing and future transportation through ongoing maintenance, preservation or reconstruction of roadway and structures.

These goals and objectives will be served by the proposed project by preserving and maintaining I-80 as an important link in the national, regional, and local transportation system through adding capacity to relieve current congestion and accommodate the 2030 travel demand, replacing the bridge structures and upgrading the mainline roadway and

[13] The WFRC LRTP will in the future be known as the Regional Transportation Plan (RTP).

access ramps to current design standards, and improving access and traffic mobility and correcting geometric deficiencies to increase safety and reduce accident rates.

Other objectives of the proposed project include:

- Providing a LOS D where feasible along the I-80 corridor
- Reducing traffic conflicts between the eastbound off-ramp at 1300 East and Driggs Avenue
- Noise mitigation, where appropriate
- Minimizing social and economic impacts to the surrounding communities due to relocations, disruption of travel patterns, construction, etc.
- Minimizing construction impacts to the surrounding communities, commuters, and interstate commerce
- Accommodating other modes of travel in the area, i.e. existing and planned pedestrian and bicycle facilities, BRT, Sugar House light rail, etc.
- Incorporating appropriate Transportation System/Demand Management measures
- Aesthetic treatments, landscaping, etc.

1.6 RELATED ENVIRONMENTAL DOCUMENTS AND RELEVANT PLANNING STUDIES

The proposed project has taken into consideration related environmental documents and relevant local and regional planning documents, including:

- *Wasatch Front Urban Long Range Transportation Plan*: 2002 – 2030, Wasatch Front Regional Council
- *Wasatch Front Urban Long Range Transportation Plan Update*: 2004 – 2030, Wasatch Front Regional Council, adopted December 2003
- Interstate 80 Major Investment Study, UDOT, July 1998
- Wasatch Front Urban Area Long Range Plan 2004-2030 Bicycle Paths
- Salt Lake City Bicycle and Pedestrian Master Plan
- Parley's Creek Corridor Trail Master Plan

Such consideration of regional planning documents and previous environmental studies is important to ensure that the proposed project would best accommodate the transportation needs of the public and incorporate all previous planning efforts for the project area, including planning for multi-modal transportation options.

1.7 DECISIONS TO BE MADE

This ES is being prepared in order to assist UDOT in deciding upon what action to take in regards to the needs of the I-80 corridor, including a No-action Alternative. The potential alternatives and the screening process are discussed in Chapter 2.

1.8 SCOPING OF ENVIRONMENTAL ISSUES

Initial scoping of the potential environmental issues in the project area revealed that the relevant environmental issues for analysis in the determination of what, if any, action to be taken includes:

- Land Use
- Social
- Environmental Justice
- Economic
- Relocations
- Pedestrians and Bicyclists
- Air Quality
- Geology, Soils, and Topography
- Noise
- Water Quality
- Cultural Resources
- Visual Conditions
- Invasive Species
- Construction

All of these environmental resources and the effects of the decision on what action to be taken, if any, will be analyzed and evaluated in Chapter 3.

1.9 FEDERAL, STATE, OR LOCAL PERMITS OR CONSULTATION

Initial scoping measures included contacting state and/or federal agencies with jurisdiction over or particular expertise with a certain environmental resource area in order to determine any concerns. Based upon our initial assessment of the environmental resources, certain resources may require further agency consultation or permitting, including consultation with the State Historic Preservation Officer (SHPO) under Section 106 regarding cultural resources and with the Utah Department of Environmental Quality, the Division of Water Quality and the Division of Air Quality. Further details about the consultation process, as well as the public involvement activities that were utilized, will be set forth in Chapter 4.

1.10 SUMMARY

To summarize, I-80 was part of the original Interstate Highway System built in the mid-to-late 1960s and the section of I-80 through Utah has not had any major reconstruction work done since its construction. Heavy usage of I-80 in the project area has resulted in deterioration of both the pavement and structures that now require attention in order to maintain I-80 as a vital link in the national, regional, and local transportation system. Operational deficiencies in the mainline and interchanges were identified that contribute to traffic congestion, higher accident rates, and other safety concerns.

The following needs were identified in the project area:

Infrastructure Deficiencies

- Pavement Deterioration
- Deterioration of Bridge Structure Integrity
- Drainage Problems

Operational Deficiencies

- Mainline Operations
  - Insufficient Shoulder Widths on Mainline
  - Insufficient Median Widths for an Open Median on Mainline
  - Lack of Auxiliary/Merge Lanes
- Interchanges and Ramp Operations
  - Insufficient Lane Widths on Interchange Access Ramps
  - Insufficient Shoulder Widths on Interchanges
  - Insufficient Acceleration/Deceleration Lane Lengths
  - Superelevation Deficiencies

Traffic Flow and Congestion

- Increase Capacity
- Improving Traffic Flow

Safety Issues

- Higher-than-expected Accident Rates
- Higher Concentration of Accidents Near Interchanges

There are also several goals and objectives that would be desirable to achieve as part of the proposed project, if possible. All of the potential environmental resources will be evaluated as part of the decision-making process as to what actions need to be taken, if any, to meet the identified purpose and needs for the proposed project.